RESEARCH BRIEF
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USC Rossier School of Education

HOW CAN PLACEMENT POLICY IMPROVE MATH REMEDIATION OUTCOMES?
EVIDENCE FROM COMMUNITY COLLEGE EXPERIMENTATION

Federick Ngo & Tatiana Melguizo
University of Southern California

ABOUT THE STUDY: Changing placement policy may help to improve developmental education student outcomes in community colleges, but there is little understanding of the impacts of these reforms. We take advantage of heterogeneous placement policy in a large urban community college district in California to compare the effects of math remediation under different policy contexts. District colleges either switched from using math diagnostics to using computer-adaptive tests, or raised placement cutoffs. We use quasi-experimental methods to identify the impact of remediation under each policy and the change in impact following placement policy experimentation. We find that switching to a computer-adaptive test exacerbated the penalty of remediation for marginal students and resulted in more placement errors. Modestly raising placement cutoffs had no significant effects.

The following research questions direct our study:

1. *What are the impacts of placement policy experimentation (e.g., switching from using a math diagnostic to using a computer-adaptive test; raising cutoffs) on remediation outcomes?*
2. *Does switching tests or raising cutoffs improve placement accuracy?*

ASSESSMENT AND PLACEMENT IN DEVELOPMENTAL MATH

Given that community colleges are open-access institutions that serve a diversity of students with a range of skills, colleges need some means of identifying readiness for college-level work. This typically happens via placement tests, and about 60 percent of all incoming community college students are placed in developmental/remedial courses in the course of the assessment and placement process.[i] However, concerns about the accuracy of commonly used placement tests have prompted calls for reform. Studies estimate that as many as a quarter of students may be mis-assigned to their math courses[ii], so policymakers and community college practitioners are seeking alternative placement tools and practices in an effort to improve math remediation outcomes.

Yet implementing placement policy is more like an art than a science. Colleges must select placement instruments, set cutoffs, and decide whether to incorporate additional measures. The reality of placement policy in community colleges is that measures are not routinely validated, and faculty and administrators often do not feel like they have adequate tools and support to select and use tests and set cutoffs appropriately.[iii] There is also scant research evidence to inform these practitioner decisions, resulting in continual experimentation with placement policy that may or may not be beneficial to students. This study contributes to this literature by presenting evidence on the impact of two types of placement policy experimentation on student outcomes: switching from using math diagnostics to using a computer-adaptive test, and raising test score cutoffs.

This research brief is based on an original research paper forthcoming in *Educational Evaluation and Policy Analysis.*

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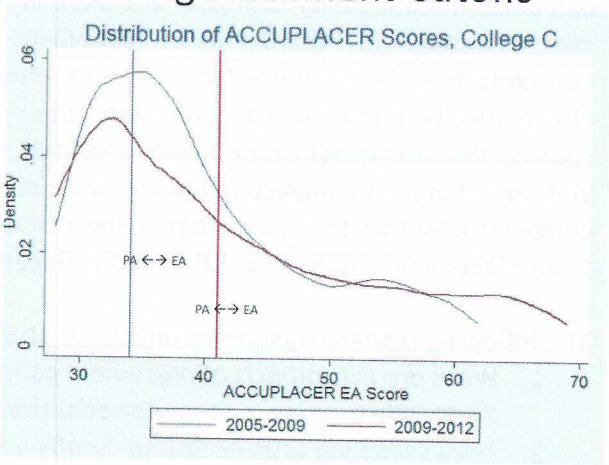
PLACEMENT POLICY EXPERIMENTATION

We examine placement policy experimentation between 2005 and 2012 in three focus colleges in a large urban community college district in California. Colleges A and B switched from using the MDTP, a digagnostic tool, to using the ACCUPLACER, a computer-adaptive test, to make placement decisions. College C raised placement cutoffs by 7 points. The chart on the left below highlights the most important differences between the MDTP and the ACCUPLACER. The figure on the right below shows that the new cutoff in College C (red) was higher relative to the student ability distribution after the policy change in 2009.

Switching Placement Tests

Mathematics Diagnostic Testing Project (MDTP)	ACCUPLACER™
• Developed by UC/CSU	• Developed by College Board
• AR, EA, PC, CLM subtests	• AR, EA, & CLM subtests
• Students typically choose subtest to start on – 40-50 questions per subtest – Referrals between subtests	• Computer-adaptive test with branching system
• Provides information specific math skills (e.g., fractions, algebra, graphing, functions, etc.)	• Provides single-score

Raising Placement Cutoffs

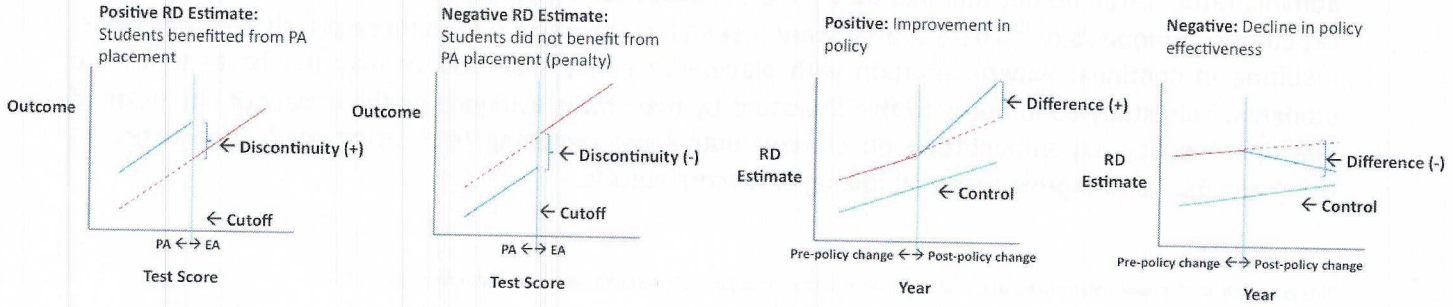


ESTIMATING THE CHANGE IN THE IMPACT OF REMEDIATION

Given that a system of placement cutoffs assigns students to the different levels of the developmental math sequence, we used a regression discontinuity (RD) design to identify the impact of placement into pre-algebra (PA) relative to elementary algebra (EA) before and after a placement policy change.[iv] A positive RD estimate suggests a benefit to placement in PA, while a negative RD estimate would suggest a penalty. This intuition is shown visually below in the figure on the left. We compared these pre- and post-change RD estimates to get an idea of whether the policy improved, worsened, or stayed the same. Since it is possible that other changes in the district, such as enrollment or budget trends may have influenced student outcomes, we used two colleges that made no policy changes as controls colleges. This enabled us to identify a difference-in-difference-in-RD estimate, or in other words, the change in the RD estimate in each focus college.[v]

Regression Discontinuity estimates the impact of placement in PA vs EA for students at the margin of the cutoff.

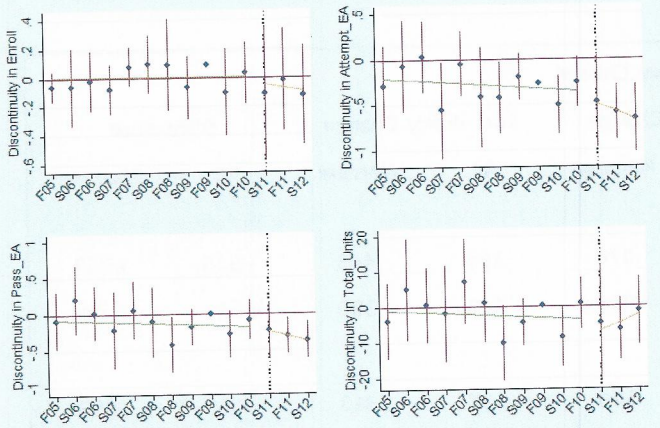
Difference-in-Difference estimates the change in this impact after a placement policy change.



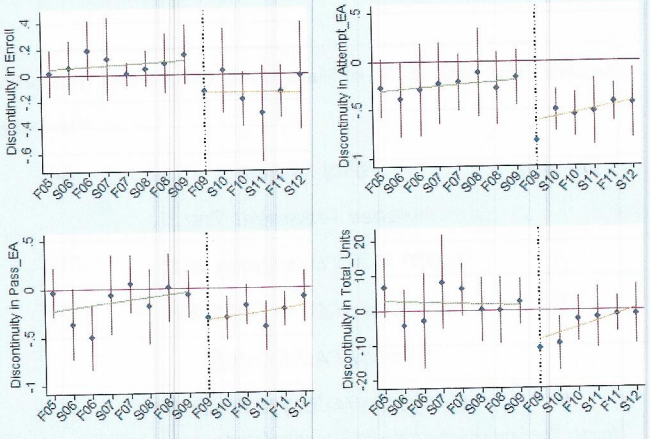
FINDINGS

SWITCHING FROM DIAGNOSTICS: We find consistent evidence in Colleges A and B that switching from the MDTP to the ACCUPLACER (policy change indicated by the dotted line) resulted in more negative RD estimates, suggesting that the penalty of remediation was exacerbated. Students were 12-15 percentage points less likely to enroll in courses, about 25 percentage points less likely to persist in their first year of college, and about 10 percentage points less likely to complete the gatekeeper math course (EA) in their first year of college. We attribute this mainly to decreased enrollment rates during the period when ACCUPLACER was used. This suggests there may have been some discouragement effect stemming from placement test results.

RD Coefficients by Math Assessment Cohort, College A

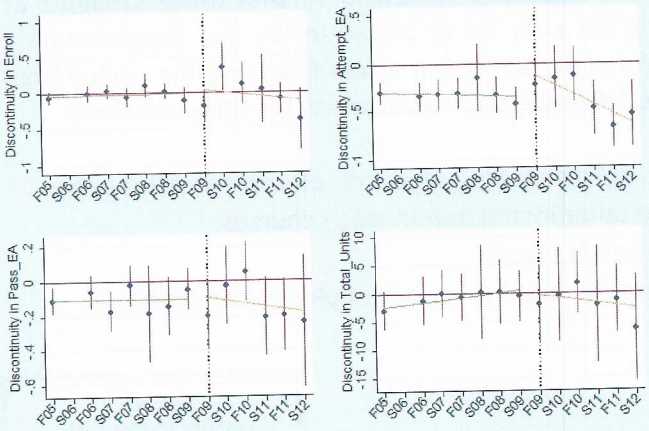


RD Coefficients by Math Assessment Cohort, College B

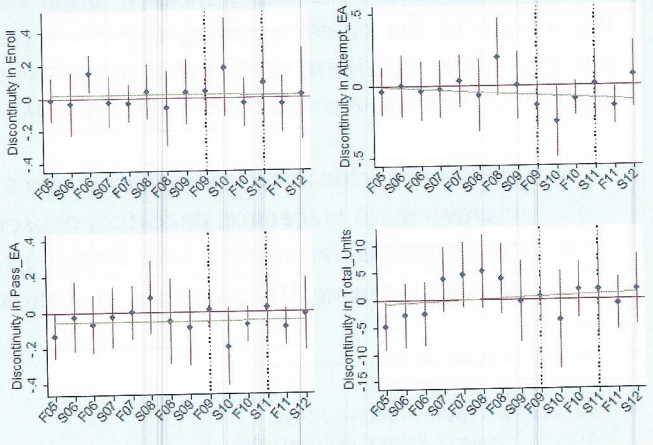


RAISING CUTOFFS: We find no significant changes in the RD estimates after College C raised the PA/EA cutoff by 7 points. Students at the margin of the cutoff were no less likely to enroll, persist, or complete courses and units within one year of the assessment. There were also no changes in the control colleges.

RD Coefficients by Math Assessment Cohort, College C



RD Coefficients by Math Assessment Cohort, Control Colleges



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FEWER PLACEMENT ERRORS USING DIAGNOSTICS

A possible logic for the observed decline in the RD estimates is that students were more accurately placed when diagnostics were used and less accurately placed when computer-adaptive instruments were used. To further investigate this hypothesis, we draw on a method described in Scott-Clayton, Crosta, and Belfield (2014) to examine placement accuracy and placement errors. They use probit models and extrapolations to estimate the rate of *severe* placement errors – the fraction of those students who are predicted to fail EA but are placed there plus the fraction of students who are predicted to pass EA with a B or better but were instead placed in PA. As presented in the table below, the rate of severe placement errors increased overall in Colleges A and B, and by about 35 percent when just considering a narrow bandwidth around the cutoff. There was a decline in error rates overall in College C, but a negligible change within a narrow bandwidth.

Severe Error Rate (SER) of Placement, Before and After a Policy Change

		Pre-Policy Change		Post-Policy Change		Difference	
Campus	Policy Change	All	Narrow	All	Narrow	All	Narrow
	Switched Placement Test						
A	*MDTP to ACCU in Spring 2011*	.062	.076	.108	.443	+.046	+.367
B	*MDTP to ACCU in Fall 2009*	.027	.045	.111	.390	+.084	+.345
	Raised PA/EA Cutoff						
C	*By 7 points (ACCU) in Fall 2009*	.274	.326	.118	.313	-.156	-.013

Notes: The Severe Error Rate (SER) is calculated as the sum of severe misplacements. This is the average of the proportion of students who are predicted to pass EA with a B or better but placed in PA and the proportion of students who are predicted to fail/withdraw from EA but placed there. The narrow bandwidth is 5 points above and below the cutoff, and the narrow cutoff in College A is 1 point above and below the cutoff.

CONCLUSIONS & POLICY RECOMMENDATIONS

The findings highlight a possible advantage to using diagnostics to make placement decisions in developmental math. All else constant, the two community colleges that switched from diagnostics to computer-adaptive tests experienced a larger negative impact of remediation, with fewer students at the margin of the cutoff enrolling and moving on to EA after being placed in PA. Our supplementary analyses show that there were higher proportions of severe placement errors following the switch from diagnostics to computer-adaptive tests. We make the following placement policy recommendations:

- The skill-specific information from diagnostics can be incorporated into placement policies to improve math placement decisions, or used to tailor instruction in math courses.
- We suggest experimenting with *lowering* placement cutoffs.
- We suggest using RD as a means to evaluate cutoffs and the impact of placement decisions.

[i] Bailey, Jeong, and Cho (2010)
[ii] Scott-Clayton, Crosta, and Belfield (2014)
[iii] Melguizo, Kosiewicz, Prather, and Bos (2014)
[iv] We focus on the pre-algebra (PA)/elementary algebra (EA) cutoff, where about half of all incoming students are placed.
[v] Checks of the internal validity of the RD and Difference-in-Difference estimates in accordance with standards for causal inference (Murnane & Willett, 2010) are available in the paper.

Contact:
federick.ngo@usc.edu

The original research article can be found in *Educational Evaluation and Policy Analysis.*